**SPECIFICATION**

**ILLUSTRATION SYSTEM FOR MACHINE OPERATION**

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**BACKGROUND OF THE INVENTION**

[0001]     The present invention relates to a work process that runs on a computer-controlled machine: the use of an image device, interfaces and a control system for monitoring a work procedure; capturing images and controlling a machine operation with a machine computer or a server computer that remotely controls one or multiple machine computers via a network.

[0002]     Automation is a widely engaging aspect in the manufacturing industry. A machine that is computer controlled and is able to have its operation of programmed job into the computer will increase productivity. However, this does not provide the solution of fully reducing the operation cost because an experienced operator is still needed to operate the machine. For example, every operation is required to be set up. The placement of the work piece and tools can be unique for each operation, which will require beforehand experience and knowledge. Furthermore, adjustment and maintenance during the operation is required which cannot be replaced simply by a pre-programmed operation.

[0003]     Another scenario would be an operation that is frequently repeated will be quicker to perform because the set-up time is minimized. However, if the operation is performed

occasionally, it would seem like a new job of each time and thus unable to reduce any time efficiency.

BRIEF SUMMARY OF THE INVENTION

[0004]     The object of the invention is to provide an illustration along with programmed job on the computer-controlled machine to overcome the aforementioned problems.

[0005]     Further, it is the object of the invention to provide an accurate and efficient method to standardize the process of each product.

[0006]     Furthermore, it is the object of the invention to provide a server computer to monitor and remotely control the work procedure and control the machine operation via a network.

[0007]     Illustrations may include set-up guidelines, position of the work piece and tools, tooling preparation or any adjustment between processes that can be recorded by capturing the image then combining it with the programmed job for an operator to follow step by step.

[0008]     In accordance with our invention, an illustration system includes an image device that continually transmits images of a machining operation to an image capturing software. The image device is a digital camera that is capable of transmitting pixel data to the machine computer. The image capturing software is a GUI (graphic user interface) that has two image containers. The first image container is for receiving the pixel data from the image device then displaying the image; the second container is capable of displaying a captured image from the first image container when the snap button is clicked.

[0009]     The image capturing software is integrated on the navigator software. The captured image is displayed on the second image container that can be dragged and dropped to the image container of the navigator software. The captured image can be stored and saved as a part of the programmed job content. The navigator software means a GUI (graphic user interface) that is capable of receiving signals from control system, outputting commands to the motor movement control and also provides the user the ability to program a job process for production.

[0010]     Control system means a device contain MCUs (micro control units) and a PLD (programmable logic device) for communication between the machine computer and the computer-controlled machine operation. The device contain at least a pair of MCUs for

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receiving position signals from the measuring device and transmitting and outputting the value to control one of the axis' motor movement. The PLD organizes all inputting and outputting signals and commands from/to the MCUs, the machine and the machine computer. One axis means one direction either of longitude, latitude or altitude of the machine movement.

[0011]     The server computer contain a server interface capable to monitor and control one or multiple machine operations through one or multiple machine computer via network.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]     Embodiments of the invention will now be described by way of examples only and with reference to the accompanying drawings wherein:

[0013]     FIG. 1 is a schematic diagram of the illustration system install on a machine operation;

[0014]     FIG. 2 is a window of the Program/Run Navigator;

[0015]     FIG. 3 is a window of the Image Capturing;

[0016]     FIG. 4 is a window of the Select Picture;

[0017]     FIG.5 is a flow chart of the operation of signal machine computer and server computer.

DETAILED DESCRIPTION OF A PERFERRED EMBODIMENT

[0018]     The preferred embodiment of the present invention will be described hereinafter in accordance with FIG. 1, FIG 2, FIG 3, FIG 4 and FIG 5. Reference numbers of the same components are identical across all figures. It should be noted that those skilled in the art are able to practice the present invention without specific details.

[0019]     Referring to the drawings FIG 1, the image device 533 has a movable arm 534 which can bend to difference directions; a stand 535 of the image device 533 is a magnetic base which can form a magnetic relationship with the surface of the machine 536. A light 532 is mounted on top of the shield of the machine to brighten the environment for the image device 533. The image device 533 is attached on the surface of the machine 536 then connects to the

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machine computer 531. The image device 533 is focused on an object then sent the image signal to the machine computer when connect interface. The object may include the work piece 537, tool 538 and their surrounding area.

[0020]      Referring to FIG. 2, the Navigator 501 is a GUI (graphics user interface) divided by two parts of the main window 507 and multiple windows 506. Difference categorize is located on difference window and is selected by tab 508 options. Program/Run is assigned to one of the tabs 508. Example of Program/Run tab is clicked; the functions and contents of Program/Run are displayed for command on multiple windows 506. Main window 507 displays all real time information relate to position that send from the measuring device via control system and the stage of tooling and stage of devices.

[0021]      Referring to FIG. 3 of the window of the Image Capturing 511. The image device is coupled the Navigator 501 by clicking camera button 502 on the main window 507 (FIG.2). The image is then continually display on the image container 512 until the image device is disconnected.

[0022]      Image can be selected and captured by clicking the snap button 514. The captured image is temporary stored in memory and displayed on image container 513. Additional clicks of the snap button 514 will capture new image that will replace the previous image and display it's in the same location.

[0023]      When the captured image has been determined to be used then points to the captured image of image container 513 by mouse, then presses down the button of the mouse. Thereon directly dragged and dropped the captured image to the image container 503 of the Program/Run of the Navigator 501. When the captured image is dragged into the image container 503, an index number for the captured image is automatic generated. When the file is saved, all the images are packaged into the one file with existing data.

[0024]      The window of Program/Run (FIG.2) has a set of commands for the select and input information at command container 504 to program the job ordering by the user. The image container 503 is located beside of the command container 504. The captured images are the illustration of the program events for following the standardized operation.

[0025]      Alternatively, image file that is stored in machine computer in a image file format can be imported to the image container 503 of the Navigator 501 without the need of directly capturing image from image device 533 to the Image Capturing 511. To perform this

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operation, double clicked the image container 503 of the Navigator 501 by the mouse, then a dialogue container of Select Picture 521 is displayed (refer to FIG. 4). Select the right path that is stored the desired image from directory box 522, and then click the file name from file name box 523. The image of selected file is displayed on the image container 524. Click the OK button 525 to confirm the selection. The Select Picture 521 is then closed and the selected image is imported to the image container 503 of Navigator 501.

[0026]    Refer to FIG 5 of the flow chart of the operation of signal machine computer and server computer. During the programmed job, a listing of the order of events including the accompanying illustration is displayed on the monitor. Thereon, clicks on the camera button 502 on the main window 507 of the Navigator 501 will connect to the image device 533, then the image is then transmitted for monitoring.

[0027]    Meanwhile, the Navigator 501 automatically detects and connects to the server computer 540 via network. In case the server computer 540 is power off or the network is unplugged, the Navigator 501 will automatically attempt to establish a connection every 10 seconds.

[0028]    When the machine computer and the server computer are connected, the server interface is receiving real time information that is sent from the Navigator 501, including current images that are sent from Image Capturing 511 then displayed on the server computer. The real time information may contain positioning values, machine information, captured image and voice warning. To control the operation from the server computer, buttons that are clicked by the mouse on the server interface cause commands to be sent to the machine computer. The machine computer relays the information to the control system to process the command.

[0029]    It should be apparent that the preceding description illustrates the current invention in one embodiment only and the invention is not restricted to the preferred embodiment. It should also be evident to those skilled in that art that variations and modifications of the preferred embodiment are possible without departing from the spirit and scope of the design. Therefore, these claims shall cover any such variations and modifications that encompass the true scope and spirit of the invention.